WHAT IS CLAIMED:

1. A method of controlling the focus errors of a photolithographic exposure tool comprising the steps of:

a) making measurements of three dimensional feature changes in a photosensitive resist;

b) generating a function which defines a relationship between said feature measurements and said focus of said photolithographic exposure tool;

c) computing from said function a best profile focus value wherein said best profile focus value is used for controlling the focus errors of said photolithographic exposure tool.

2. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 1 wherein said step a) comprises:

exposing a focus expose matrix wafer by varying exposure levels and focus conditions wherein said feature measurements include a plurality of edge width versus focus data points for any given one of said exposure levels.

3. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 1, wherein said measurements of said step a) are stored.

4. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 2, wherein said plurality of edge width versus focus data points are plotted for each of said exposure levels.

5. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 2 wherein said plurality of edge width vs. focus data points are retained for a default exposure level.

6. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 5, wherein step b) comprises computing a derived an equation which characterizes said plurality of edge width vs. focus data points to define said function.

7. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 6, wherein a second derivative of said derived equation is solved to obtain said best profile focus value for said feature where said second derivative is equal to zero.

8. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 7, wherein measurements of a specific three dimensional feature type are made across an exposure field on a production wafer.

9. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 8, wherein said three dimensional measurements comprise edge width measurements

10. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 9, wherein an average of said edge width measurements is calculated.

11. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 10, wherein said average edge width is input to said function to derive a measured focus of said feature type on said production wafer.

12. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 11, wherein a difference between said measured focus and said best profile focus value is fedback to said tool thereby controlling focus errors of said tool.

13. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 11, wherein a difference between said measured focus and an optimal product focus offset is fedback to said tool thereby controlling focus errors of said tool.

14. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 6, wherein said equation defining said function is a cubic of the form:

$$y = Ax^3 - Bx^2 + Cx + D,$$

where **y** is the edge width, **x** is the focus, **A**, **B**, **C** and **D** are empirically derived coefficients.

15. The method of controlling the focus errors of a photolithographic exposure tool as claimed in Claim 7, wherein said second derivative solving step results in an equation:

$$6Ax + 2B = 0,$$

wherein the solution x representing said best profile focus value is governed by the equation:

$$x = -1/3*(B/A).$$

16. A method of controlling tilt errors of a photolithographic exposure tool comprising:

a) making measurements of three dimensional feature changes in a photosensitive resist;

b) generating a function which defines a relationship between said feature measurements and a focus of said photolithographic exposure tool;

c) computing from said function x/y tilt values wherein said x/y tilt values are used to control said tilt errors of said photolithographic exposure tool thereby achieving an optimum x/y tilt offset.

17. The method of controlling tilt errors of a photolithographic exposure tool as claimed in Claim 16, wherein step a) comprises:

exposing a focus expose matrix wafer by varying exposure levels and focus conditions wherein said feature measurements include a plurality of edge width vs. focus data points for any one of said exposure levels.

18. The method of controlling tilt errors of a photolithographic exposure tool as claimed in Claim 16 wherein step b) comprises computing a derived equation which characterizes said plurality of edge width vs. focus data points at a default exposure level to define said function.

19. The method of controlling the tilt of a photolithographic exposure tool as claimed in Claim 16, wherein step c) comprises:

a) using said function to obtain said x/y tilt values including a y tilt value, θ_y, corresponding to a trigonometric relationship that relates a distance, $\mathbf{D_y}$ between measurement sites on a production wafer, an edge width derived focus, $\mathbf{F1_y}$ taken from an extreme lower position of an exposure field, and an edge width derived focus, $\mathbf{F2_y}$, taken from an extreme upper position of the exposure field;

b) using said function to obtain said adjustments including an x tilt value, θ_x, corresponding to a trigonometric relationship that relates a distance $\mathbf{D_x}$ between measurement sites on the wafer, and edge width derived focus $\mathbf{F1_x}$ taken from the

extreme left position of said exposure field, and an edge width derived focus, $\mathbf{F2_x}$ taken from the extreme right position of said exposure field;

c) feeding back said x tilt value, θ_x to said photolithographic exposure tool; and

d) feeding back said y tilt value, θ_y to said photolithographic exposure tool.

20. The method of controlling the tilt of a photolithographic exposure tool as claimed in Claim 19, wherein said y tilt value, θ_y, is governed by the equation,

$$\theta_y = \arctan((F2_y - F1_y)/D_y);$$ and,

said x tilt value, θ_x is governed by the equation,

$$\theta_x = \arctan((F2_x - F1_x)/D_x).$$

21. The method of controlling the tilt of a photolithographic exposure tool as claimed in Claim 20, wherein said y tilt value in microradians being governed by the equation,

$$\theta_y = \arctan((F2_y - F1_y)/D_y)*(Pi/180)*1E6;$$ and,

said x tilt value in microradians is governed by the equation,

$$\theta_x = \arctan((F2_x - F1_x)/D_x)*(Pi/180)*1E6.$$

22. A system for controlling the focus errors of a photolithographic exposure tool comprising:

a) means for measuring three dimensional feature changes in a photosensitive resist;

b) function generation means for defining a relationship between said feature measurements and said focus of said photolithographic exposure tool;

c) means for determining from said function a best profile focus value wherein said best profile focus value is used to control the focus errors of said photolithographic exposure tool.

23. The system as claimed in Claim 22 for controlling the focus errors of a photolithographic exposure tool, wherein said means for measuring further comprises:

means for obtaining said measurements based on varying exposure levels and focus conditions wherein said measurements include a plurality of edge width versus focus data points for any one of said exposure levels.

24. The system as claimed in Claim 23 for controlling the focus of a photolithographic exposure tool wherein said function generation means includes means for deriving an equation which characterizes said edge width versus focus data for a default exposure level to thereby define said function.

25. The system as claimed in Claim 24 for controlling the focus errors of a photolithographic exposure tool further including means for solving a second derivative of said equation for said best profile focus value wherein said second derivative is equal to zero.

26. The system for controlling the focus errors of a photolithographic exposure tool as claimed in Claim 25 wherein an average of measurements of a three dimensional feature type on a production wafer is input to said function to derive a measured focus of said three dimensional feature type on said production wafer.

27. The system for controlling the focus errors of a photolithographic exposure tool as claimed in Claim 26 wherein a difference between said measured focus and said best profile focus value is fedback to said tool thereby controlling focus errors of said photolithographic exposure tool.

28. The system for controlling the focus errors of a photolithographic exposure tool as claimed in Claim 26 further comprising:

a) means for obtaining x/y tilt values including a y tilt value, θ_y, corresponding to a trigonometric relationship that relates a distance, $\mathbf{D_y}$ between measurement sites on said production wafer, an edge width derived focus, $\mathbf{F1_y}$ taken from the extreme lower position of an exposure field, and an edge width derived focus, $\mathbf{F2_y}$, taken from an extreme upper position of the exposure field;

b) means for obtaining said x/y tilt values including an x tilt value, θ_x, corresponding to a trigonometric relationship relating a distance $\mathbf{D_x}$ between measurement sites on the wafer, and edge width derived focus $\mathbf{F1_x}$ taken from the extreme bottom position of said exposure field, and an edge width derived focus, $\mathbf{F2_x}$ taken from the extreme top position of said exposure field;

c) means for correcting said photolithographic exposure tool with said tilt values, θ_x ,θ_y.

29. A computer program product comprising:

a computer usable medium having computer readable program code embodied therein for implementing focus error control of a photolithographic exposure tool, the computer readable program code in said computer program product comprising:

a) first computer readable program code for causing a computer to measure three dimensional profile changes of a feature in a photosensitive resist;

b) second computer readable program code for causing the computer to store said measurements;

c) third computer readable program code for causing the computer to generate a function which defines a relationship between said feature measurements and said focus of said photolithographic exposure tool;

d) fourth computer readable program code for causing the computer to calculate from said function a best profile focus value wherein said best profile focus value is used to control the focus errors of said photolithographic exposure tool.

30. The computer program product as claimed in Claim 29 comprising fifth computer program code for inputting to said function an average of measurements made on a specific three dimensional feature type across an exposure field on a production wafer to derive a measured focus of said specific three dimensional feature type on said production wafer.

31. The computer program product as claimed in Claim 30 comprising sixth computer program code for computing a difference between said measured focus and said best profile focus value, then feeding back said difference to said photolithographic exposure tool wherein said focus errors of said photolithographic exposure tool are controlled.

32. The computer program product as claimed in Claim 30 comprising:
seventh computer readable program code for causing the computer to calculate x/y tilt values from said measured focus, wherein said x/y tilt values are used to control tilt errors of said photolithographic exposure tool whereby an optimum x/y tilt offset is achieved.

33. A method of checking the focus of a photolithographic exposure tool comprising:

a) making a data collection of EW data associated with said exposure tool versus barometric pressure data over a predetermined time period;

b) storing said data collection;

c) making a comparison between a current focus setting of said exposure tool exposed to a current barometric pressure and said stored data collection;

d) notifying a user that a tool problem exists based on said comparison.